Volume 40 September, 1954

Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

Logging and
Sawmill Machinery
Lubrication

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LUBRICATION

A TECHNICAL PUBLICATION DEVOTED TO THE SELECTION AND USE OF LUBRICANTS

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Logging and Sawmill Machinery Lubrication

THE story of converting timber in the woods to marketable lumber is a story of men and machines. Current logging practice is a far cry from the fabled days of Paul Bunyan. Today, modern machinery is designed to save labor, speed-up production, and promote safety and is dependent on effective lubrication. Machines of many types are required to harvest the log crop and convert all of it to useful products. It has been said that the meat packing industry uses every part of the hog except the squeal. The lumber industry claims it uses every part of the log, even the bark and the accumulated sawdust.

In the logging and sawmill phases of the lumber industry, there are many variations in equipment, machinery and methods of operation in different areas of the country. There is, however, one thought that is common throughout – reduce down time – keep the machinery in efficient operation as long as possible! In a broader sense, this means getting maximum efficiency from a piece of machinery for at least its life expectancy. This, of course, involves many factors. Of outstanding importance is the utilization of machinery which is powerful, tough and efficient. When the best piece of equipment has been selected for the job or combination of jobs, it can be kept in maximum service only by employing proper lubrication techniques with the right lubricant for each moving part and by adhering to a suitable maintenance schedule. This relationship can be shown best by following the log from the timber stand through the sawmill and discussing the operations and lubrication requirements of the equipment involved.

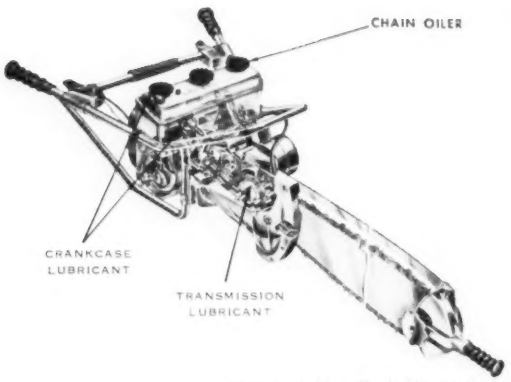
LOGGING OPERATIONS

Chain Saw

The story begins in the woods with the timber that has been selected for harvesting. Today, the portable chain saw is employed extensively by the timber fallers. It is powered in most cases by a two cycle gasoline engine and the power is transmitted through reduction gears to the cutter chain. Successful operation of the two cycle gasoline engine requires strict adherence to the manufacturer's recommendation with respect to oil-gasoline ratio, types of oils and fuels used and the proper method of mixing and storing these products.

The octane requirement of the two cycle engine is well below the level that generally is found in either white (unleaded) or regular grade gasoline. Some manufacturers recommend a white gasoline which contains no tetraethyllead. Since regular gasoline with lead is readily available, other manufacturers have agreed to its use in chain saw engines.

With the introduction of heavy duty oils in the automotive field, the question sometimes arises as to the effect of the additives contained in these oils on the performance of two cycle engines. The response of chain saw engines to oil additives varies, since one engine may be designed for high load carrying capacity, another for high speed and a third may be a compromise between the two. In general, lubricating oils containing heavy duty type



Courtesy of McCulloch Motors Corp.

Figure 1 — Two man chain saw.

additives have a greater tendency to form combustion chamber deposits and increase spark plug fouling than do straight mineral oils. However, heavy duty motor oils offer much better protection against rust and corrosion during periods of storage and they reduce wear. They are desirable in the fuel mixture during the period just prior to lay-up when preparing the engine for periods of inactivity.

Some manufacturers advise that the chain itself be lubricated with an SAE 30 grade oil in the summer, SAE 10 grade in winter, and a mixture of four parts SAE 10 oil and one part kerosine at temperatures below 0°F. During the sawing operation, the oil should be applied at regular intervals to ensure maximum power, preserve the life of the chain and maintain cutting efficiency. For proper cutting operations and safety it is important that the tension of the chain be correct and be checked periodically.

Yarding in the Northwest

After the timber fallers have felled the trees and bucked them into sawlog lengths, they are yarded or dragged out for loading on trucks or railroad cars. In a few areas, logs are floated down rivers to the mill. No one knows better than a logger that no two logging operations are alike. In the Pacific Northwest, the Highlead System of yarding logs is most commonly used to clear cut timber. However, there are skidding systems using skylines and the choice depends upon the nature of the terrain and whether the logging involves the movement of logs from cold decks or hot decks to a landing. Cold deck pertains to a spot where logs are piled until needed. The deck becomes "hot" when it is expedient to have yarding and loading operations working from the same deck. These methods of logging require hundreds of feet of strong wire rope and a yarder with a powerful diesel or gasoline engine to handle the big heavy logs.

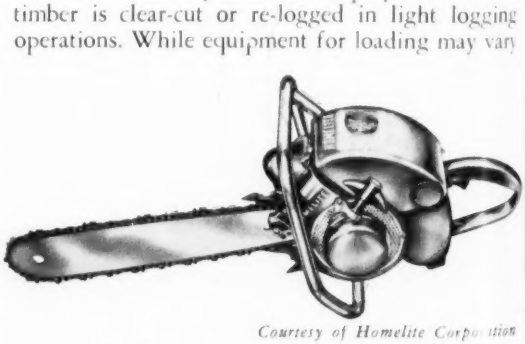
Yarders and Loaders

Yarders can be mounted on crawler tracks, wheels or skids. A yarder may be used as a loader or vice versa depending upon the number of drums installed and the system employed. In general, a yarder consists of main and haulback drums set in direct line. A straw drum is mounted on the haulback shaft and holds a light cable for rigging. The number of drums may vary to include a skidding drum, utility drum or other adaptations. Power is supplied by diesel or gasoline engines and the transmissions can be of the conventional gear type, or combinations with fluid coupling and torque converter. The brakes and clutch may be operated manually or remotely by air. The shafts are mounted on antifriction bearings and are rotated by exposed gears and chain drive.

The bushings, bearings and friction heads need a grease which will provide a tough adhesive film to cushion against shock and seal out dirt. For satisfactory performance, daily application of the lubricant is recommended. The exposed gears need a lubricant which will cushion load shocks, reduce wear, adhere to the gears despite high pressures, temperatures, and peripheral speeds and which will not channel. The grade will depend upon the atmospheric temperatures. Care must be taken not to over-lubricate, since the excess may drop on the friction blocks and impair their function. The chain can be lubricated with a good grade SAE 20 oil for temperatures from 20° to 40°F. and SAE 30 for 40° to 100°F. A lubricant which protects against rust will add to the life of the chain.

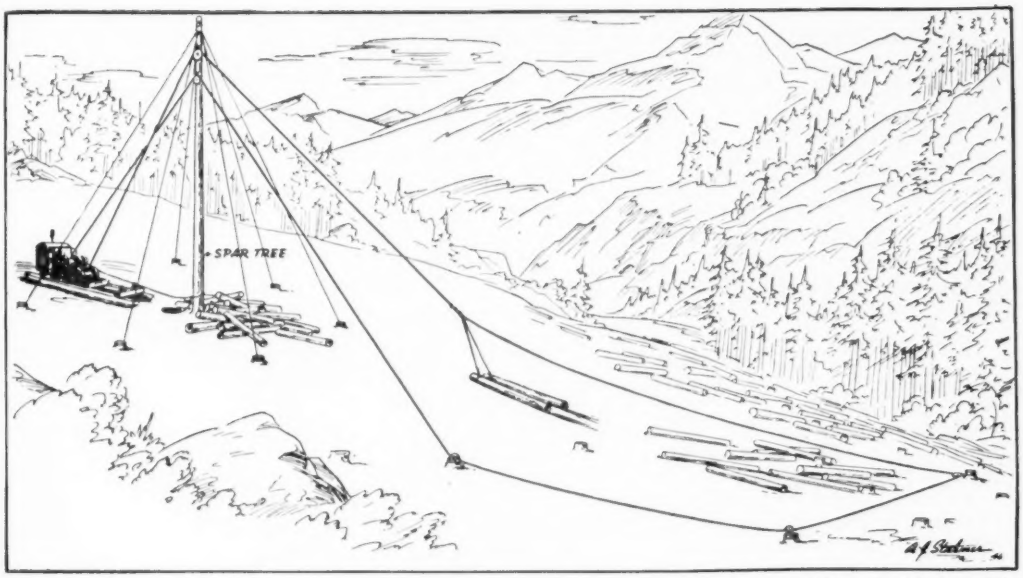
Crawler, Yarding and Loading

In many sections of the country, logs are harvested by crawler tractors. A skidding tractor is used for short hauls over rough terrain or where it is feasible to pre-bunch logs. When the logs have to be yarded longer distances, an arch or sulky pulled by a tractor is more efficient. The arch or sulky provides means to carry the forward ends of logs off the ground. A tractor yarder or donkey and skyline or slackline systems are employed when the timber is clear-cut or re-logged in light logging operations. While equipment for loading may vary



Courtesy of Homelite Corporation

Figure 2 — One man chain saw.



Courtesy of Skagit Steel & Iron Works

Figure 3 — Highlead yarding is adapted to yarding clear-cut areas of any size timber.

with each operation, loaders mounted on crawler tracks or tires and booms equipped with slings, tongs or crotch line with end hooks have wide acceptance.

Wire Rope in Yarding and Loading

For the most part, the wire ropes used for the main and haulback lines in yarding are not lubricated in the field because they are in constant contact with the ground. Often the wire rope is broken by heavy loads before it can be worn out. In all other applications, rope will last longer and give better performance when it is lubricated and protected against wear, rust and corrosion. Wire rope in loaders and sawmill operations is continually moving and flexing as it runs over pulleys and drums. Under such conditions, friction develops; also moisture is able to get in between the strands and rust the rope's interior. Rust and corrosion of the interior strands are difficult to detect and, therefore, are all the more serious.

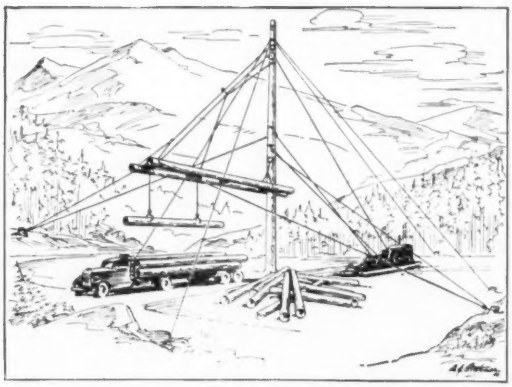
A quality wire rope lubricant applied correctly will help minimize wear and offset the effect of water, corrosion and excessive heat. Proper application involves saturating the core and being certain that the proper amount of lubricant penetrates between all the strands.

Straight mineral petroleum products with a viscosity ranging from 500 to 1000 seconds Saybolt at 210°F., having proper adhesive, fluidity, and penetration characteristics, are most effective. A wire rope lubricant should not contain any corrosive material which could affect the core or fillers. Some materials of a tarry nature may have a certain amount of acid which is detrimental and damaging to the fibres of the rope. Fillers such as asbestos and flake graphite may, in service, flake or crack the protective film and permit objectionable material to enter between the wires. A material which is too heavy or viscous is objectionable, since its ability to penetrate may be reduced. Sometimes operators apply products such as highly viscous gear lubricants because they adhere to the outside strands of the rope and appear to be satisfactory. Such products are not recommended, since frequently they do not penetrate to lubricate the strands nor to saturate the core adequately.

Crawler Mechanisms

The crawler mechanisms consist of sprocket driven endless chain formed by hinging together short sections of track shoes. On the back of each shoe are two short parallel rails which combine to form a track on which run small wheels called track wheels, truck wheels, track rollers, bogie wheels, etc. These are carried on plain sleeve type bearings or roller bearings.

Plain bearing track rolls need a lubricant that is stringy, tacky, semi fluid, water repellant and easily pumped. A heavier grade is recommended for temperatures above 90°F. It is not good practice to oil rollers that were packed originally with grease at the factory. Grease packed assemblies normally are relubricated at 1000 hour intervals by grease with good heat and oxidation stability, good pumpability, cold temperature characteristics and mini-



Courtesy of Skagit Steel & Iron Works

Figure 4 — The McLean Boom Loading system involves two sets of tongs, boom rigged to the head tree and power supplied by the loader.

mum effect on synthetic rubber boots of the lubricant seals. When installing a track roller on its shaft, care must be taken not to damage the seal. While the track roller is a simple rugged mechanism, it is more subject to wear than any other lubricated part on a tractor or loader and must be given a certain amount of care. Most cases of undue wear result from failure to apply the right lubricant at the right time.

Hydraulic Power Transmissions

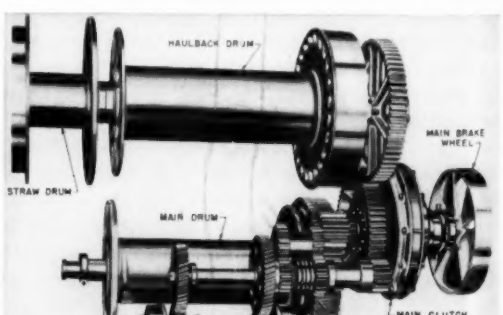
Hydraulic power transmission units are employed in logging winches and yarders, loaders, construction machinery and tractors. They have the advantage of a cushioning effect which protects the prime mover, intermediate gears and other drives from shock loads, excessive strain and torsional vibration, thus resulting in longer service life of the equipment. The need for such protective devices as shear pins is eliminated. In addition, the prime mover is not stalled by a sudden application of heavy load. The transmission units are various combinations of fluid coupling or torque converter and multi-speed gear transmissions. A fluid coupling is in effect a fluid clutch which transmits torque, but it is not a torque multiplier. A torque converter serves as a clutch and transmission in that it transmits and multiplies torque.

Specially designed fluids have been developed to meet the requirements of hydraulic power transmissions. It is essential that the oil not oxidize or deteriorate, since oil oxidation products such as varnish and sludge are very harmful to the unit. Fluids containing service tested oxidation inhibitors are recommended. The oil also requires adequate rust inhibitors, since small amounts of rust can damage precision built parts considerably. The formation of foam causes erratic operation and the oil needs added anti-foam properties. A pour point below anticipated atmospheric temperatures and a flash point above 175°F. are necessary for satisfactory operation. The fluid must not affect seals adversely. A fluid with a high viscosity index ensures minimum change in viscosity as a result of changes in operating temperatures. The viscosity requirements differ somewhat according to the manufacturer.

Lubrication Hints for Logging

Good lubricating practices will pay dividends by reducing wear and down time and assisting the machine to function at top efficiency. The conditions under which the equipment operates should be the basis for setting a regular lubricating schedule. Here are some "dos" and don'ts" to be considered:

Establishment of regular drain periods, but remembering to drain crankcase oils while hot, at the same time, checking air cleaners, filters, etc. Avoiding contamination of the parts while they are being serviced or cleaned. Don't over grease anti-friction bearings and be sure to remove the excess from the fittings. Grease can be added to plain bearings until clean grease shows at the point old grease is forced out. Do not lubricate either the wire rope which constantly drags in the dirt or the pin between individual track plates in crawler tracks. Prevent petroleum products from contacting natural rubber, certain synthetics, clutches and brake shoes. Petroleum products stored in the open can be contaminated easily with water and dirt if proper care is not taken. This is a serious problem in logging operations, since drums of petroleum products are left out in the open in a convenient spot near the equipment. Place the drums on their sides so water will not collect on top and have a chance to enter through the bungs. Even if a bung is



Courtesy of Hyster Company

Figure 5 — A cut-away view showing drums and gears of a tractor yarder.

Courtesy of Hyster Company

Figure 6 — Logging pine with an arch on a tractor.

tight, the drum can breath in moisture due to variations in temperature and humidity. Petroleum products are stored best in locations where they are free from contamination by dust and debris. Obtain the best product that will do the job; in the long run it saves money. Follow the manufacturers lubrication and service recommendations, since reliable marketers will stand behind them if followed as directed.

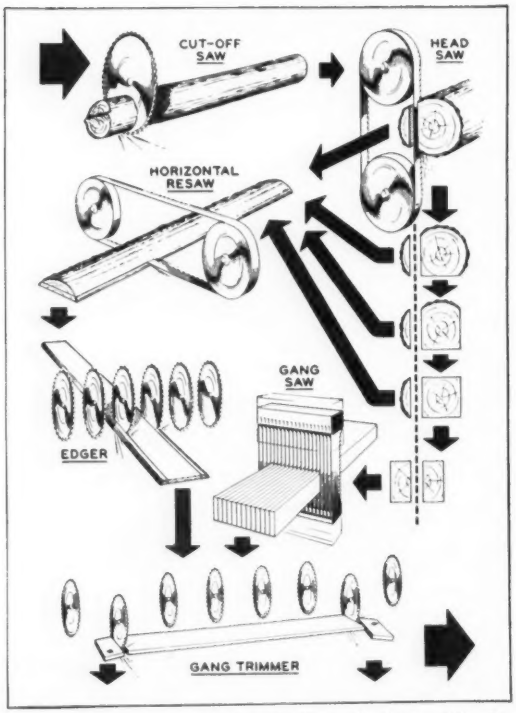
IN THE SAWMILL

The sawmill's supply of logs is stored in a log pond and/or cold deck. The log pond is a cheap method of storage, reduces dirt and extraneous material by washing, prevents checking and has many other advantages. Here, the logs are selected for different purposes. Long logs are cut to desired length by a pond saw near the foot of the jack-ladders or by a cut-off saw on the log deck. These saws may be circular, chain, or drag type. The logs are elevated from the pond to the log decks by an endless chain with log dogs, called among other things log haul-ups, jack-ladders, etc. A parallel chain haul-up which elevates the logs sidewise instead of lengthwise is common to some locations. The speed and nature of the chains depend upon the daily capacity of the sawmill and the size of the logs. Usually the maindrive gear and head sprockets are found at the upper end of the conveyor and on the head shaft. The tail sprockets are connected to the shaft at the lower end of the conveyor. This equipment is subjected to severe strains and shock loads so that it is fabricated with the best material available. The logs may be washed by a stream of water during the haul-up to remove objectionable material. In some mills, the logs are debarked mechanically or hydraulically before proceeding to the head rig. One or more steam or air kickers push the logs on to the log deck from the jack-ladder. A log stop and loader hold the logs until they are fed onto the carriage. A steam or air log turner or "nigger" pushes the logs firmly against the knees of the carriage and turns them as required by the sawyer. In some cases, endless chains and travelling dogs bring the logs to the carriage or the line-up man when a gang saw is being fed.

The Carriage

The carriage is one of the most important pieces of equipment in the sawmill. It is kept in perfect adjustment at all times, since it is required to work with great precision. The log is held on the carriage securely as it starts and stops quickly and shuttles back and forth at a high rate of speed. The carriage is composed of head blocks, knees, dogs, setworks, drive and various accessory equipment. The head blocks are of two types: the screw block and the rack and pinion. The knees move forward and backward on the head blocks and the movement is regulated by the "setter" who rides the carriage and manipulates the controls according to the head sawyer's instructions. A taper-set quadrant and lever may be attached to a knee so that it can be moved to permit logs with a taper or flaring butt to be sawed in line parallel to the bark.

The log carriages are mounted on trucks, each having two or more wheels depending on the weight and size of the loads. The wheel nearer the



Courtesy of Electric Machinery Mfg. Co.

Figure 7 — This diagram shows the various types of saws found in a mill and their function.

saw has a flat tread and runs on a flat rail. The one on the opposite side has a V grooved tread to fit a specially made V-planed guide rail which eliminates any lateral movement of the carriage. The tracks require a lubricant that will maintain lubrication under heavy loads and moisture conditions, in addition to sticking on the surface at all times. Under some conditions, a product containing graphite may be suitable. Since contamination by wood scraps and moisture is always present, the practice of frequent relubrication will pay dividends.

In large sawmills equipped with a single cutting bandsaw, the carriage has an offset which may be operated electrically, pneumatically, or mechanically. The offset throws the carriage away from the saw line on the gig run or return run to prevent the saw from contacting the log. Some band saws have sliver teeth opposite the cutting edge to ensure a clearance cut on the return run of the carriage. Offsets are not necessary if the saw is circular, double cutting or has sliver teeth.

The dogs are mounted inside or alongside the knee and may be actuated by air or hydraulic cylinders or electric motors. The dogs hold the log firmly in place on the head blocks against the knees. There are several types, including a hammer dog with spike arm and hammer and the "boss" dog with lever actuated hooks thrust out from the knees, to mention two.

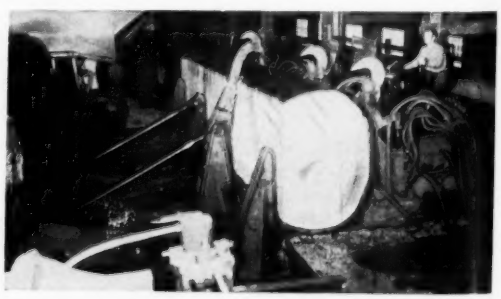
Carriage Feed Works

Steam Feed Drives

The feed works drive the carriage and controls the rate at which a log is fed to the head saw. Feed works make use of friction, electric, hydraulic or steam piston drives. In addition, the drives may be connected to the carriage directly or by means of a drum and cable. In most instances, the steam "shot gun" feed consists of a piston head in a single long cylinder, extending the full length of the carriage travel and connected directly to the carriage. A variation of the steam piston feed consists of piston heads in short twin cylinders delivering power through connecting rods, which turn a crankshaft connected or geared to a drum. A lever controls the intake and exhaust at each end of the cylinder so as to apply steam pressure to either face of the piston head, and thus advance or reverse the carriage. The controls are operated by a sensitive valve and have to function at the slightest touch. If not lubricated properly, a reduction in cut could result. Although wear is not too much of a problem, an oil which keeps it as sensitive as possible is needed. Where steam is involved, the difficulties attendant to cylinder condensation, wet steam and frequently considerable pressure drop must be considered. Normally a highly refined, compounded steam cylinder oil is recommended, having a viscosity in the range of 125 to 165 seconds Saybolt at 210°F. and containing five to ten percent compound.

Hydraulic Feed Drives

Hydraulic feeds have at least three variations in power transmission; the turbine, the oil motor and the single piston. In the turbine, oil under pressure is forced through the turbine blade, thus turning a shaft connected to the drum. The oil motor has a series of small pistons radially placed on a rotating cylinder that is concentric with a fixed hub or pintle containing oil passages. In the single piston hydraulic feed, a cylinder of about one half the dis-



Courtesy of The Timberman

Figure 8 — Log on carriage is about to be turned by a Simonson Log Turner.

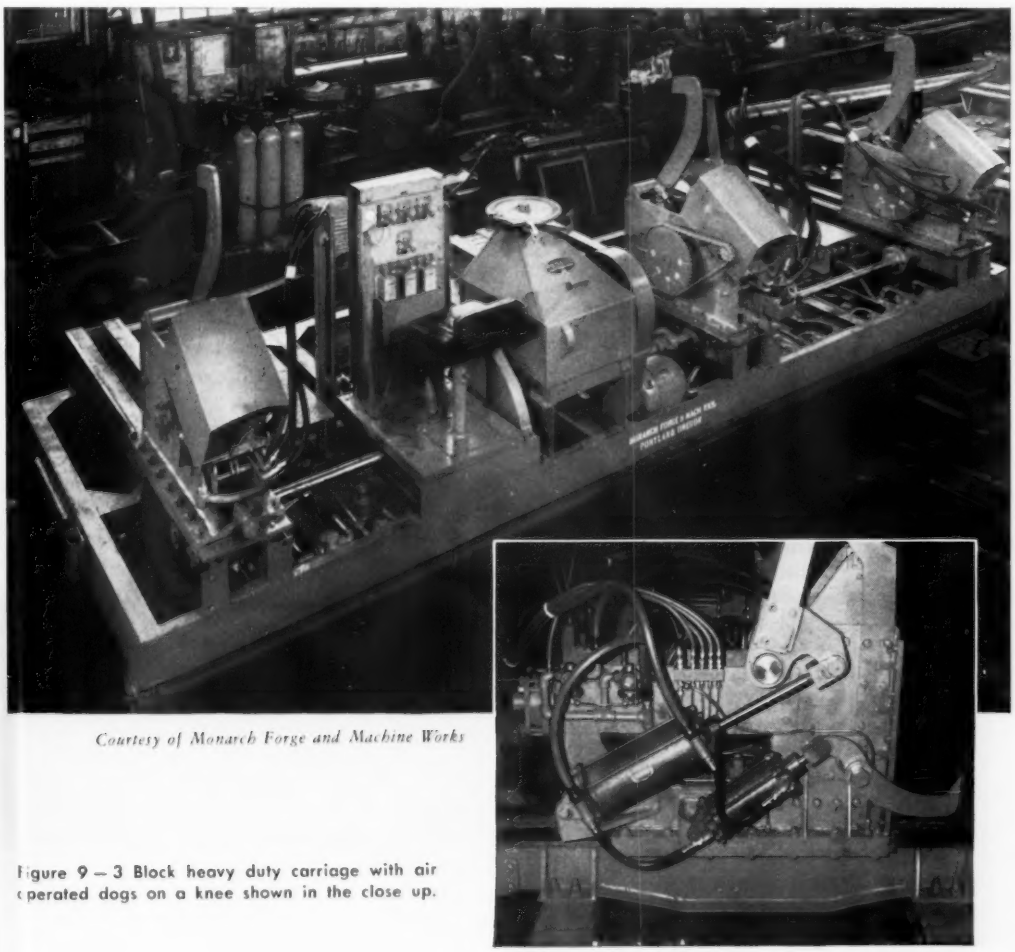
tance of the carriage travel is attached by a wire rope and pulley system to the carriage. By this means, the carriage is able to move twice the distance travelled by the piston.

Hydraulic equipment is made with precision and its efficiency depends upon close tolerances. Formation of rust, gum, sludge, cavitation or even foam could impair the efficiency required and even cause stoppage. An oil for this type of equipment must be of the best quality available and specifically designed for hydraulic systems. It should be a highly refined paraffin oil having anti-rust, anti-wear, anti-oxidation and anti-foam characteristics. The viscosity requirements will depend upon the service conditions and the manufacturers recommendations. Normally, approximately a 300 or 400 second oil is recommended, depending upon the unit and ambient temperatures.

Electric Feed Drives

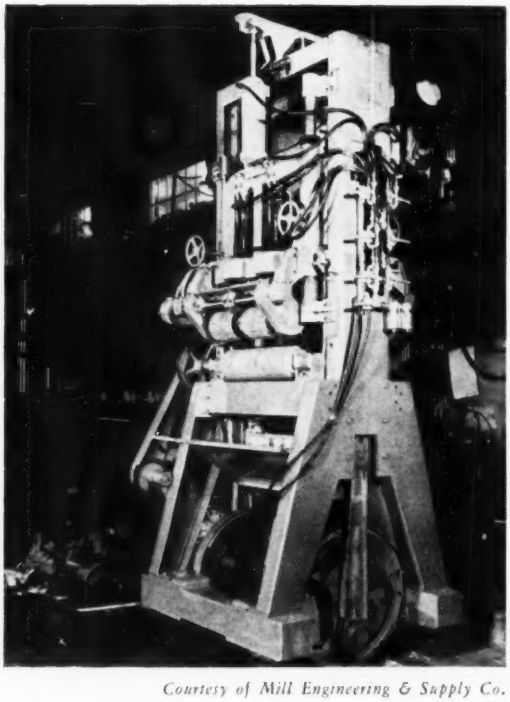
Electric feed drives consist of an electric motor and generator connected to a gear reducer unit which is attached to the shaft of a cable drum. One of the desirable features of the new electrical drive systems is their great ability to magnify current.

Electric feed drives, as with any electric motor or generator, deserve premium quality products for lubrication purposes. Normally, the anti-friction bearings are designed for grease application, and only a product which is specially manufactured for anti-friction bearings is completely satisfactory. A suitable top quality grease has proven itself many times under similar applications. It will protect the precision-made bearings from corrosion and contamination and will resist thinning down so that leakage from the bearings will not occur. A quality grease remains stable under the oxidizing and wide range temperature conditions found in service, and thus preserves the life of the motor bearings. If the electrical equipment is designed for oil lubrication, products with built-in anti-rust and anti-oxidation characteristics provide excellent lubrication. Nor-



Courtesy of Monarch Forge and Machine Works

Figure 9 — 3 Block heavy duty carriage with air operated dogs on a knee shown in the close up.



Courtesy of Mill Engineering & Supply Co.

Figure 10 — Gangsaw with double feed rolls driven by an electric variable speed motor.

mally, a viscosity range of 150 to 500 seconds Saybolt Universal at 100°F. is recommended.

Function of the Set Works

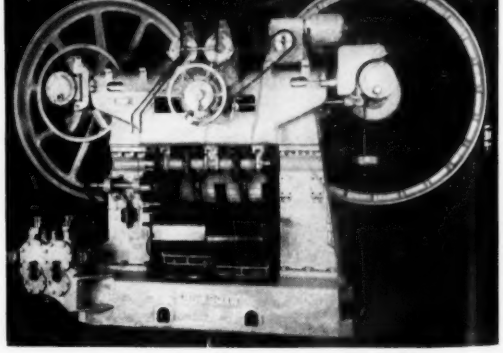
The set works regulate the size of the board or slab to be cut. They are operated by hand, air, hydraulic, steam or electric motor. It is important that this mechanism be free to work accurately under all conditions in order not to vary the cut of lumber. In addition, slow functioning set works will reduce the total footage run through the mill. Gears inclosed in a tight casing require an SAE 140 gear oil in warm weather and SAE 90 gear oil or SAE 40 motor oil in winter. If the gear case leaks, it may be necessary to use a light grease. Exposed gears require a suitable open gear lubricant which is adhesive and resists moisture. The exposed screws controlling movement in the head block are lubricated best with a product having adhesive and oiliness properties which help it stay on and also resist wear. The same type of lubricant can be applied on the ways of the head block.

Head Rig

The log is carried on the carriage to the head saw which cuts it into timbers or "cants". The head saw may be a circular saw, band saw, double cutting band saw or gang saw depending upon the logs to be cut, the desired form of lumber, and various economic considerations. The circular saw is in wide use where relatively large quantities of small or low grade logs are handled and maximum output per man is desirable. In large mills, this type of saw is driven by an electric motor, but in small mills it may be driven by an internal combustion engine. The band saw is a continuous band of steel from nine to sixteen inches wide with teeth on one or both edges. It travels around two wheels at the rate of about ten thousand feet per minute. One wheel is above the cutting field, while the heavier wheel is below. Power is applied to the lower wheel. High speed is attained by mounting the arbor on anti-friction bearings. Lubrication requirements will vary somewhat according to the strain and design of the bearings. In the band saw-wheel there are sleeve-type bearings which may be subjected to some 2,800 rpm wheel speed and a strain of 35,000 lbs. Oil must be directed to the bottom half of the upper wheel bearings and the top half of the lower wheel bearings. Generally, a highly refined oil of about 300 seconds Saybolt at 100°F. is applied. Also, an oil which has additional built-in anti-rust and anti-oxidant characteristics is desirable.

Other modern band saws have anti-friction arbor bearings which require grease lubrication. The grease is normally an NLGI No. 2 grade which will perform satisfactorily over a wide temperature range and which has excellent stability characteristics and high resistance to oxidation.

The gang saw may be one of three types: the sash gang, Scandinavian gang or the circular gang. These saws are operated by the gang sawyer and the line-up man. It consists of a row of saw blades set parallel in the vertical frame and driven by a crank through a connecting rod which imparts the necessary reciprocating motion. The rigid construction is necessary, since the mechanism carries a heavy load and is subjected to considerable heat.



Courtesy of Prescott Company
Courtesy of Bijur Lubricating Corp.

Figure 11 — 7 foot horizontal resaw showing metered lubrication.

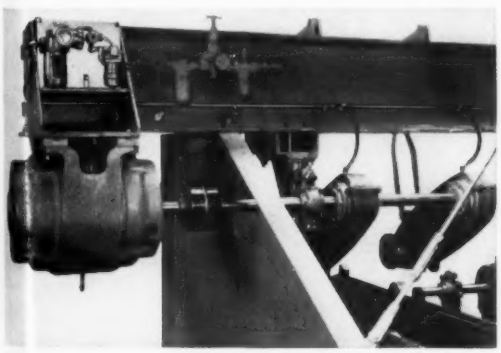
A highly refined oil with anti-rust and anti-oxidant porperties in conjunction with an automatic lubricator is highly desirable for maintaining adequate lubrication. Sometimes a spray of water is projected on the crankpin bearings to maintain proper temperatures. In this case, it may be necessary to apply a highly refined oil containing 5-10% compound.

Resawing

Resawing is acomplished by vertical or horizontal band saws or circular saws when thick slabs or cants are cut into board thicknesses. From the head saw or resaw, the cants or rough boards move by the transfer chain to the edger, which produces boards with parallel sides and removes the rounded edges or wane from the boards after they come from the head rig. It also divides wide boards into two or more widths. The edger may be single or multiple saws on a single mandrel or arbor. In the multiple-saw type, the saws slide along keys fixed on opposite sides of the arbor. Free movement of the saws on the keys requires lubrication with an oil which will resist being thrown off by centrifugal force, and which will prevent interference by resins and pitch. A light oil with a Saybolt Universal viscosity at 100°F. of 100 to 200 seconds containing a material which will impart adhesiveness and will have a solvent effect on the pitch or resins from the board is effective. The arbor bearings may be collar-oiled sleeve bearings or anti-friction type. If oil lubricated, a highly refined oil exhibiting anti-rust and anti-oxidant properties, with a Saybolt Universal viscosity at 100°F. in the range of 250 to 350 seconds, is recommended depending on service conditions. If designed for grease lubrication, a NLGI grade 2 product of premium quality, manufactured for the type of bearing found in service, is required.

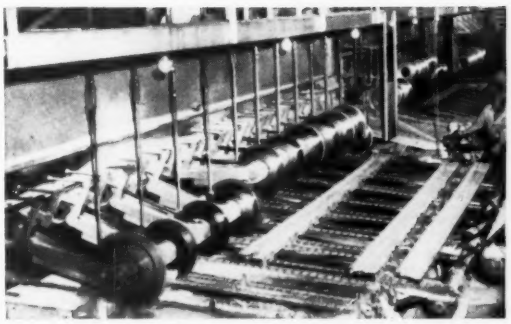
Final Cutting

After the boards leave the edgers, they move side ways on transfer chains to a battery of standard-spaced small circular saws or trimmer saws which square the ends, remove the defects, and cut the board into desired lengths. These saws attain speeds of about 450-700 rpm and are attached to a swinging frame which generally is lowered by pneumatic cylinders or by pulleys and wires. Some mills have automatic over head trimmers wherein the intermediate saws are raised by the passing board and only the two end saws remain down. The trimmerman still has positive and immediate control. Sometimes a system of shadow lines is employed as a visual aide in trimming the boards. This system has a fixed light behind several carefully placed lines which casts a shadow on the boards and aids the trimmerman to gauge the cut. When the boards leave the trimmer saws, the sawmill processing is finished. The "green" or freshly cut lumber moves to a long platform known as the green sorting dock or green chain. The lumber is sorted for grade, size, and species as well as destination or further treatment. It is separated into stock that will be air dried or kiln dried.



Courtesy of Stewart-Warner Corporation

Figure 12 — Metered lubrication to chain drive of trimmer saws.



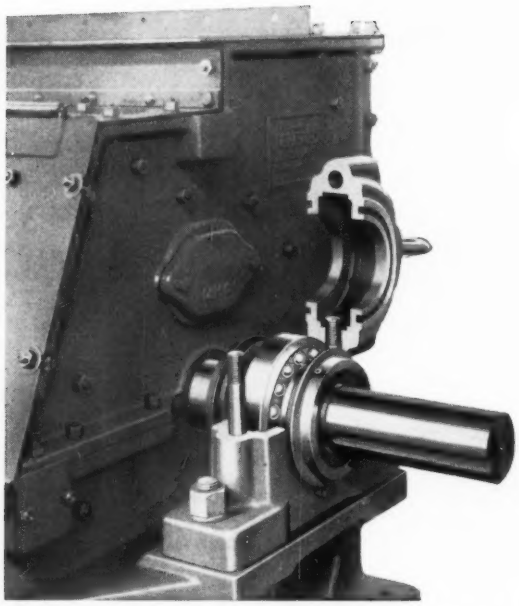
Courtesy of The Timberman

Figure 13 — Trimmer saws in action.

Slasher and Hog

The slasher consists of circular cutoff saws, arranged on a single shaft to cut slabs, edgings, and refuse for use as fuelwood, broom handle stock, lathe stock or other purposes. The saws travel at a speed of about 900 to 1000 rpm.

In some mills, waste either is burned as refuse or is converted by means of a hog or chipper into small equally sized pieces to be used for fuel or in the manufacture of pulp, paper, hardboard, etc. Hogs handle any form of refuse that can be placed in the spout. These machines may have knives attached to a cylinder, V shaped spools with knives or chisel-type hammers passing through spaced discs on the shaft. They are driven by an electric motor and lubrication involves a good grade of anti-friction bearing grease that will support the load and resist moisture.



Courtesy of The Jeffery Manufacturing Co.

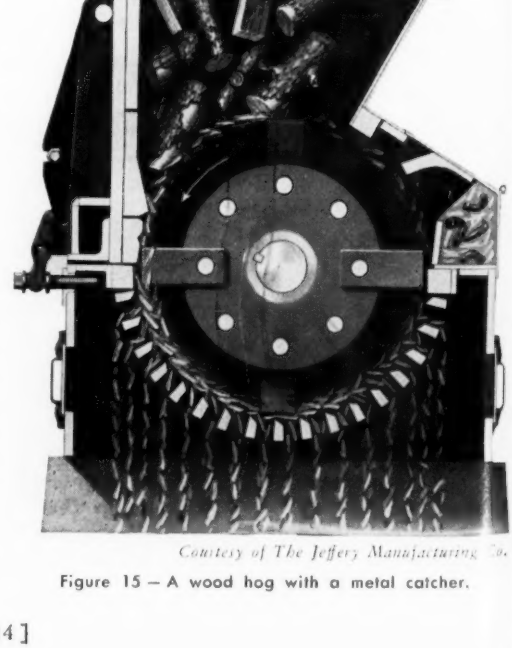
Figure 14 — Anti-friction bearing on shaft of a hog.

Design Features of Modern Sawmill Machinery

The modern sawmill equipment is manufactured to include the use of ball and roller bearings so that less power is consumed and high speeds can be attained. In sawmill operation, the lubricant is exposed to contamination by sawdust, dirt and moisture, and every possible effort must be made to prevent foreign material entering the bearings. Ball and roller bearings are fabricated with seals for this purpose. If a seal is broken, immediate replacement should be made. When abrasive foreign material is found in anti-friction bearings, always remove it, clean the bearings and repack them with a fresh charge of clean lubricant. These precision bearings require products made especially for them. Such products are free from acid-forming tendencies and have anti-corrosive and good anti-oxidation properties. A grease forms an effective seal against the entry of contaminating material. Under high temperatures, it maintains proper consistency and will not liquefy or run out of the bearings. With a quality grease, the bearings run cooler, because excessive internal friction is not generated. It is well to bear in mind that over packing ball and roller bearings will cause them to run hot due to the heat of internal friction. In such cases, the difficulty lies not with the grease, but the method of packing. The housings of high speed bearings normally are charged from one quarter to one half full. For oil lubricated bearings, the housings usually are filled to a level just sufficient to submerge half the surface of the lowest ball. A somewhat lesser amount of oil is sufficient for high speeds and relatively more for low speeds. Under high speeds the correct amount of oil will enter the bearing if the flow is controlled by wick feed, sight drip feed or other means of automatic application. A tight housing will eliminate oil leakage. The viscosity of the oil corresponds to the service conditions and the selection of oils for these bearings must be made with care, since too heavy an oil will result in excessive drag. A premium grade oil which has anti-rust and anti-oxidation properties is desirable.

Air Power

Compressed air actuates many mechanisms in some sawmills. Air compressors are lubricated by an oil which will protect the bearings against corrosion with minimum friction, will keep the rings clean and free from gummy deposits that cause sticking and will prevent carbon deposits on the valves. In most air compressors, highly refined straight mineral naphthenic oil with viscosity of approximately 300 seconds Saybolt Universal at a 100°F. is satisfactory. If humidity in the air is high, a rust and oxidation inhibited naphthenic oil of a premium type is preferred. An inhibited oil will provide protection against rust formation on the interior surfaces of the compressor, intercoolers, aftercoolers and distributing lines. Care must be taken to adjust the positive feed so that the correct volume of oil reaches the cylinders. Too small an amount allows metal to metal contact and too much



Courtesy of The Jeffery Manufacturing Co.

Figure 15 — A wood hog with a metal catcher.

Courtesy of The Chain Belt Co.

Figure 16 — Lumber being carried to top of hoist where it moves on to automatic stacker.

is a waste. Since there is danger of contamination of the unit with sawdust, adequate precautions are advisable to preclude its entry into the air intake. It is a good practice to cover the air intake with a suitable filter and locate the compressor in an area relatively free from contamination.

Conveyors

Conveyor systems find a wide variety of uses in the sawmill. Chains, belts, blower systems and rolls all play a part in the movement of material in the modern mill. Sawdust is an ever present by-product and frequently is removed by a continuous chain fitted with lugs which travels in a U shaped trough. It moves at a slow rate of speed under a working strain from 300 to 1000 pounds and is driven by chain and sprocket transmission or by belt. While the chain itself is never lubricated, sprocket and chain drives and idlers require an adhesive lubricant to protect against rust and contamination by dust.

Live rolls in contrast to deadrolls are power driven in that they rotate mechanically by belt, chains or gears. Rolls of modern design are fabricated from steel tubing mounted on ball bearings and are designed to indicate when sufficient grease has been supplied. A good grade of ball and roller bearing grease will decrease maintenance cost and reduce the power drive requirement. The lubricant should protect against undue wear and corrosion. The film of the lubricant helps to protect against contamination with moisture which forms rust and with abrasive material which causes wear. Although the majority of rolls are grease lubricated, some are designed for oil, using plain bearings. The oil lubricant may be supplied by cups or oil rings, and the grease by means of a pressure gun.

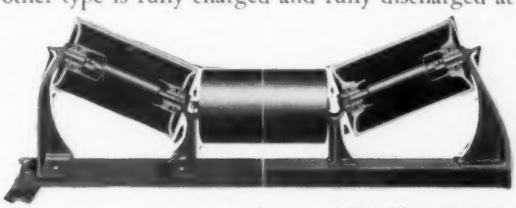
Skid transfer chains powered by steam, air or electricity can be raised above the rolls by the operator, thus causing lumber to move sideways from the rolls. Some chain assemblies are designed for grease lubrication while others have oil applied by drip, brush or bath. In cases where lubrication of the chain is practical, the product should protect against rust and corrosion and help prevent wear caused by contaminants and heavy loads.

Dry Kilns

The stacking and unstacking of lumber in preparation for kiln drying or shipment is becoming mechanized, and automatic machines have general acceptance. The boards are fed by chain to the automatic stacker which may be a platform elevator that descends as the pile builds up. The stickers are fed automatically in between the boards from a magazine. Stickers are narrow boards of the same lumber as the pile and are used to separate the courses of the lumber in piles. The unloaders are L shaped and are tilted so that one layer of boards in the pallet can be pushed by an automatic arm on to a conveyor chain. Electric motors through gear reduction units and chain drives power the stackers and unstackers or unloaders.

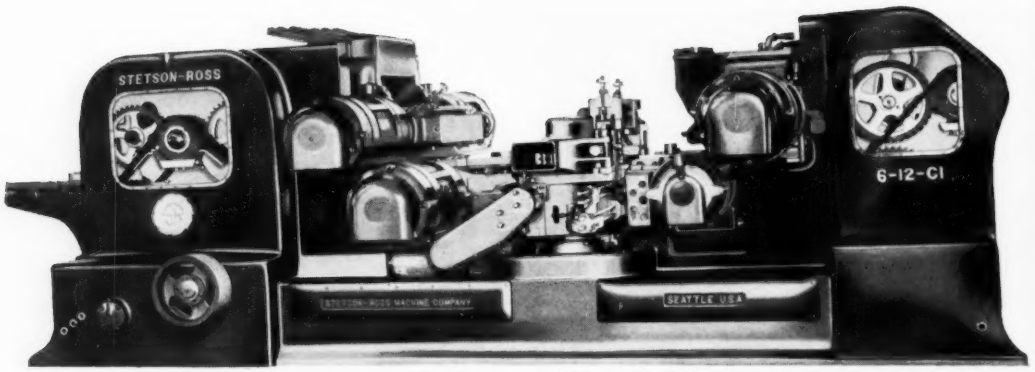
In general, green lumber is dried by air or in a kiln, or by combination of the two methods. The first consideration is to stack the boards so air can circulate freely and reduce their moisture content. The kilns are heated either by steam coils or radiators. Ventilated kilns use chimneys for circulation of air and elimination of moist air. Humidity is supplied by steam spray pipes. Condensing kilns have cold water sprays to condense the excess water from the air and create circulation. Forced draft kilns may have either fan blowers for circulation and spray pipes, or steam jet blowers for circulation and humidifying. These kilns eliminate surplus moisture by ventilation.

Some kilns are loaded at one end and an equal amount is taken out daily at the opposite end. Another type is fully charged and fully discharged at



Courtesy of The Chain Belt Co.

Figure 17 — Tubular steel belt conveyor idler showing labyrinth grease seals and tapered roller bearings.



Courtesy of Stetson-Ross Machine Company

Figure 18 — 14-knife ball bearing planer and matcher showing fully enclosed oil bath lubricated feedworks visible through plexiglass window.

one time. The temperature will vary from 225 to 350°F. and the drying period differs with the system, the type of lumber, the quality desired and the intended end use.

Lubricants are supplied only to the wheels of the cars and the electric motors driving the fans. The kiln car wheels need grease which will stand the high temperatures and stay in the bearings. Some wheels are mounted on a plain axle and, therefore, the grease has to be very adhesive to remain in the journal. High temperatures and the presence of moisture necessitate that the lubricant resist oxidation and the formation of objectionable deposits.

The kiln fans may be oil or grease lubricated according to the design. The oil is applied by wick feed oil cups or automatic lubricators. It should resist oxidation and reduce rust formation and have a viscosity (normally 300 SSU at 100°F.) such that it will feed through the applicator with no difficulty. The grease should afford the same protection and lubrication under the prevailing conditions.

Planing

Most large mills have facilities to plane and pattern lumber. Planers may surface one or two sides and one or two edges. In addition, the machine may be a planer and matcher which has built-in profilers for making lumber patterns. These machines can be fed at a rate up to 800 f.p.m., and the heads have a speed of 3600 rpm. The planers are precision machines which run at high speeds. Blowers are generally located over each machine to carry off the sawdust.

These machines require the best lubricants available that will perform under high speed conditions. The ball bearings and precision cutter head spindles use a light highly refined turbine oil of approximately SAE 10 grade. In some cases, provision is made to meter out the exact amount of oil necessary for the bearings. Ball bearings having grease fittings use a premium grade of lubricant manufactured to provide adequate lubrication under high speed conditions. The feed table gears require a grease that adheres to the surfaces of the gears and will not be thrown off easily by centrifugal force. The entire feed works system is enclosed and lubricated with a highly refined medium heavy turbine oil.

Whenever precision built high speed equipment is to be lubricated, it is false economy not to purchase the best grade of products available. It is the only way to prolong its precision characteristics and produce at high speeds for maximum production.

CONCLUSION

Before World War II, the lumber industry had a history of either feast or famine. Since that period of time, it has become a stable industry on a firm financial basis. A program to ensure the continuous supply of raw material for the wood using industries is well established. Through research and foresight, new industries, such as those making pressed board and plywood, and new products including wax, insulation and chemicals have been developed which protect the future demand for timber as a raw material. As in most industries, management strives to improve plant and logging operations by purchasing modern machines, new tools and products to raise efficiency, production and quality. The petroleum industry, as in the past, works side by side with the lumber industry to fulfill the need for improved petroleum products which will lubricate the latest designed machines, so that there is the least interruption by "down time".

Today, practically everything in the woods is run on petroleum products, which in no small way have contributed to the present day efficiency and high production found there. The petroleum industry makes available its research facilities and lubrication experience, so that lubrication problems are solved and future demands for new products are anticipated.

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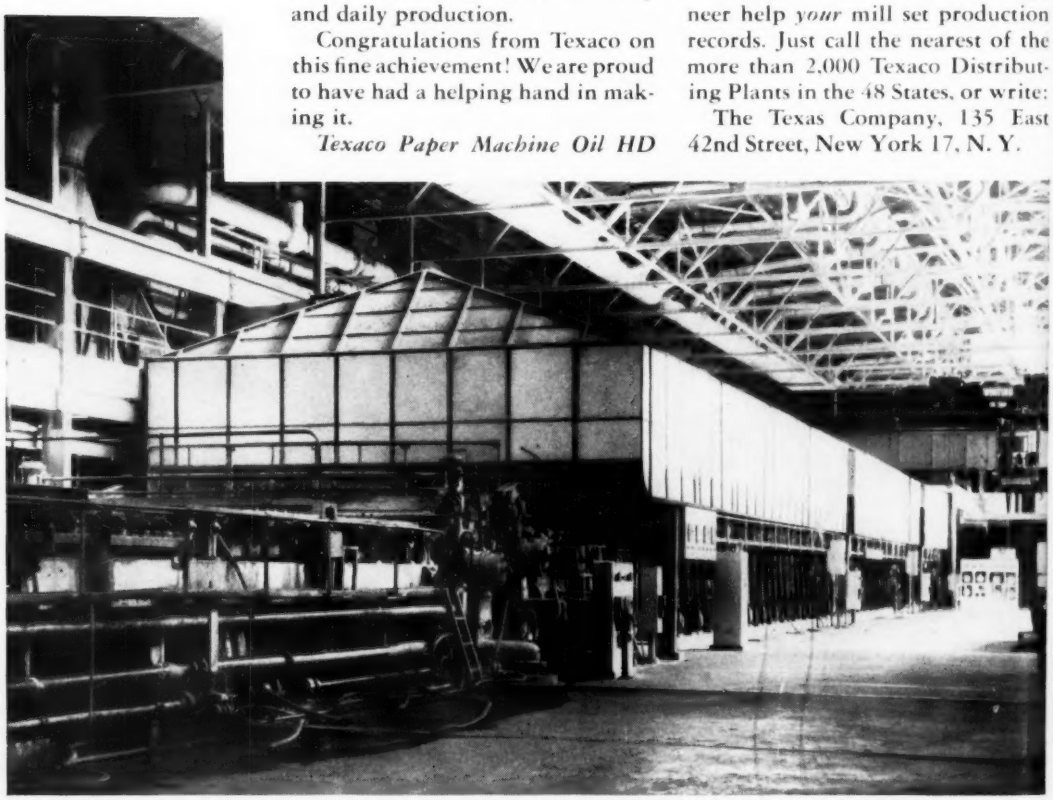

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